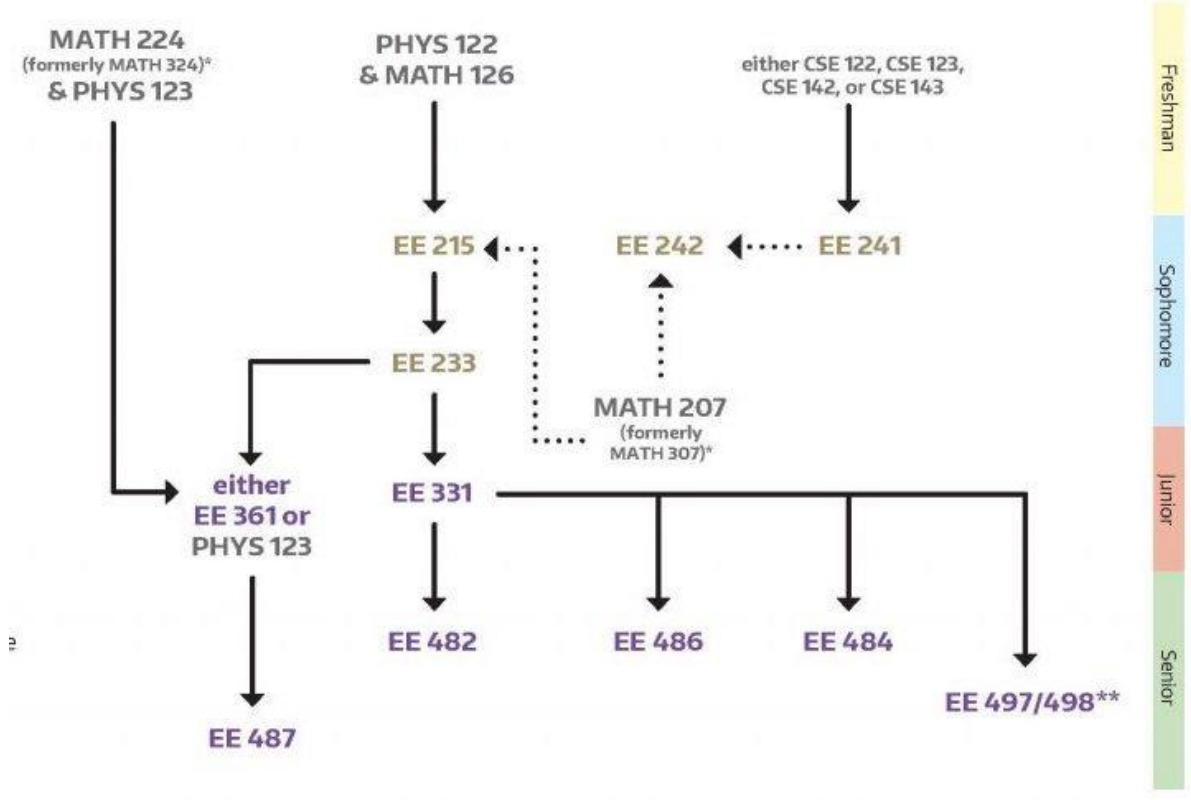
Advanced Electronic & Photonic Devices Concentration Area Review May 2024

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices

Course Flowchart (33 credits)



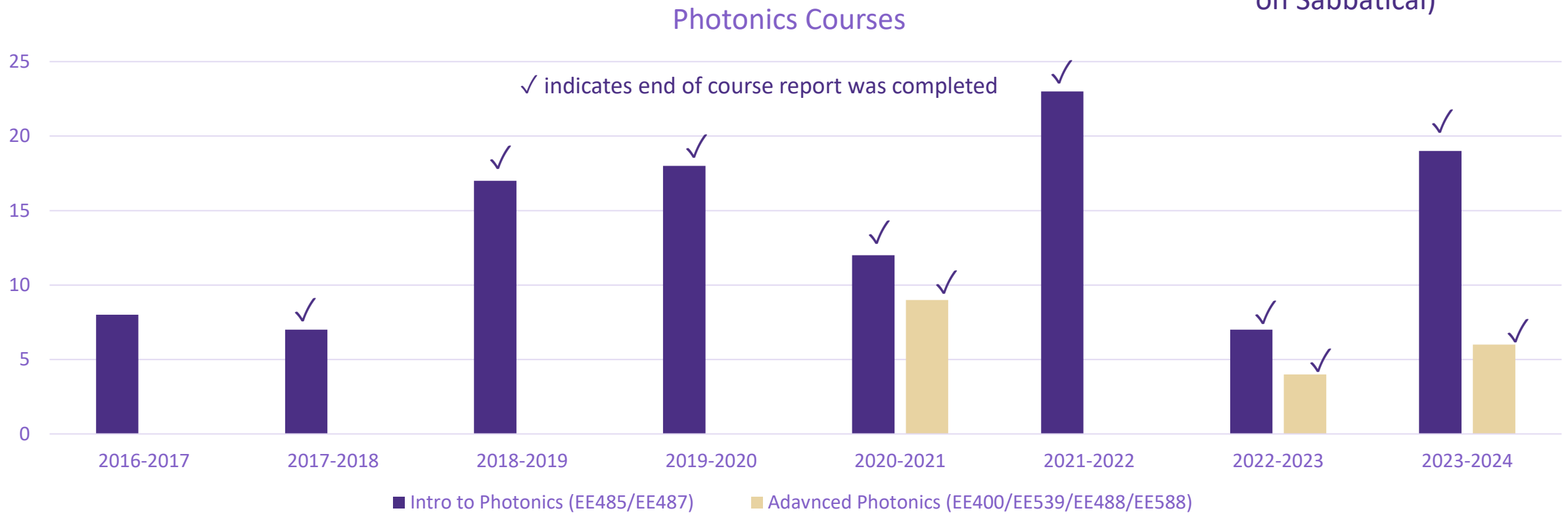
In the BSECE degree, AEPD has been replaced by two primary pathways:

- Microelectronics and Nanotechnology: EE331, EE421, EE482, EE484
- Photonics: EE361, EE487, EE488

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices Course Enrollment (Photonics Courses)

Advanced Photonics not offered (Lih Lin on Sabbatical)

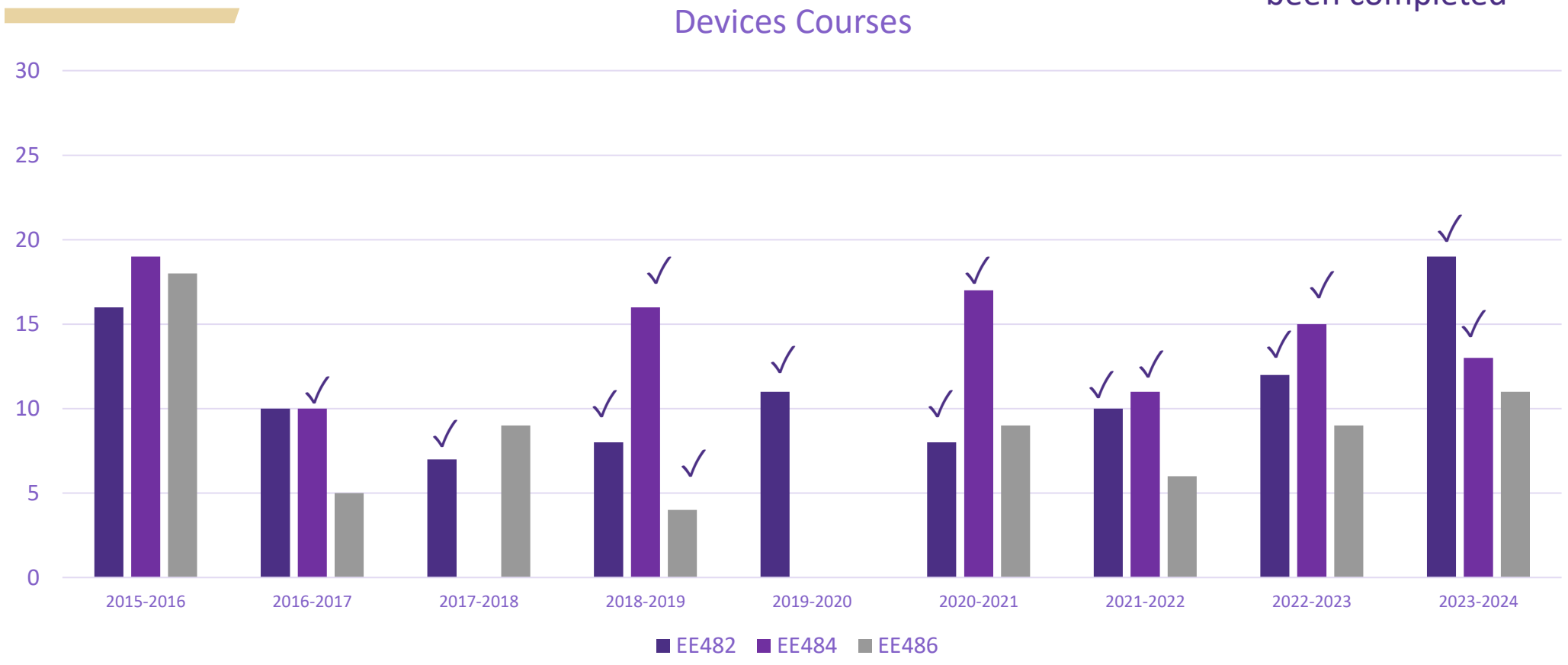


Starting in Autumn 2022, these courses have been offered as EE487/EE587 (Introduction to Photonics, Autumn) and EE488/EE588 (Advanced Photonics, Winter)

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices Course Enrollment (Devices Courses)

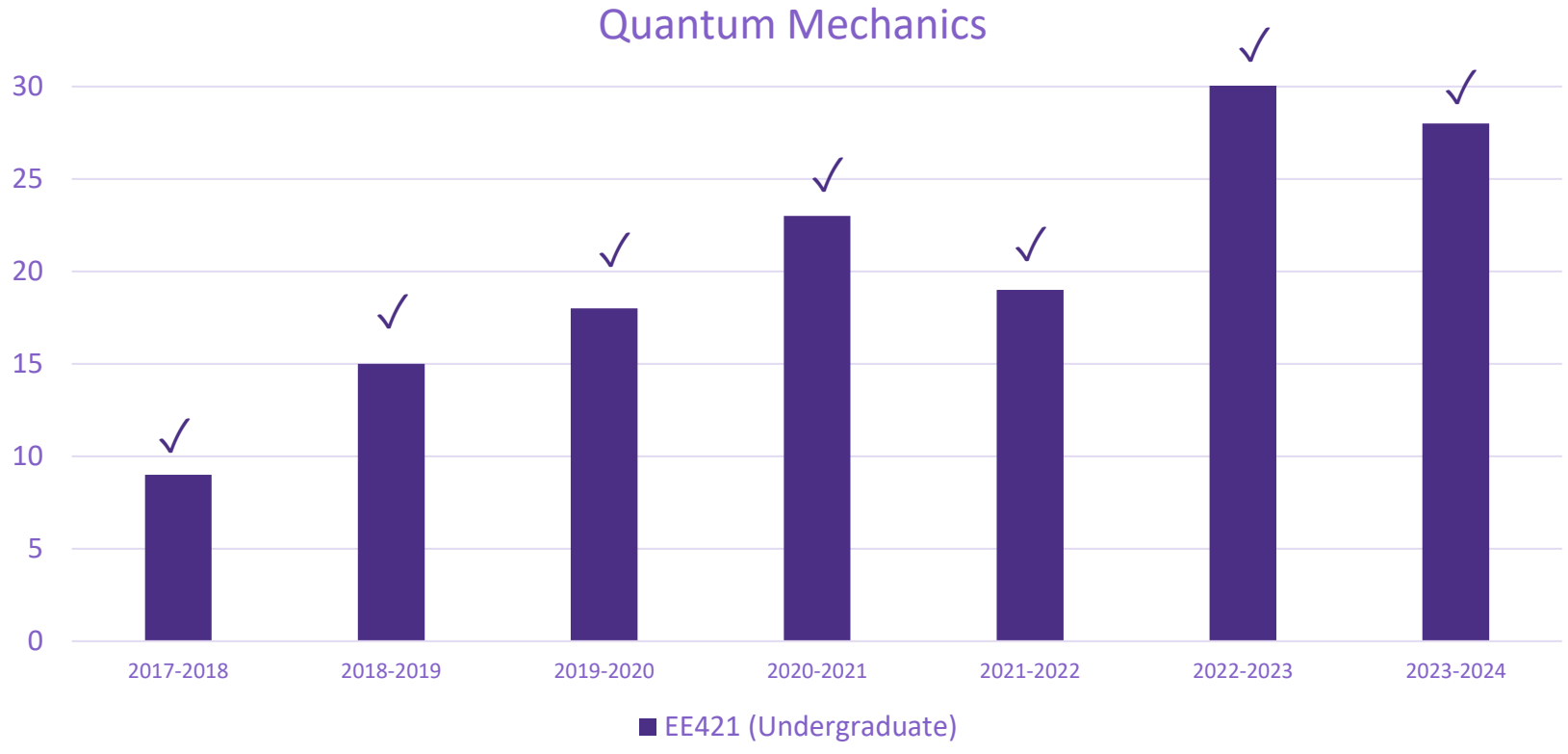
✓ Indicates that end of course report has been completed



EE482: Semiconductor Devices
EE484: Sensors and Sensor Systems
EE486: Integrated Circuit Fabrication Technology
(cross-listed with MSE486; only EE enrollment shown)

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices Course Enrollment (Quantum Mechanics Courses)



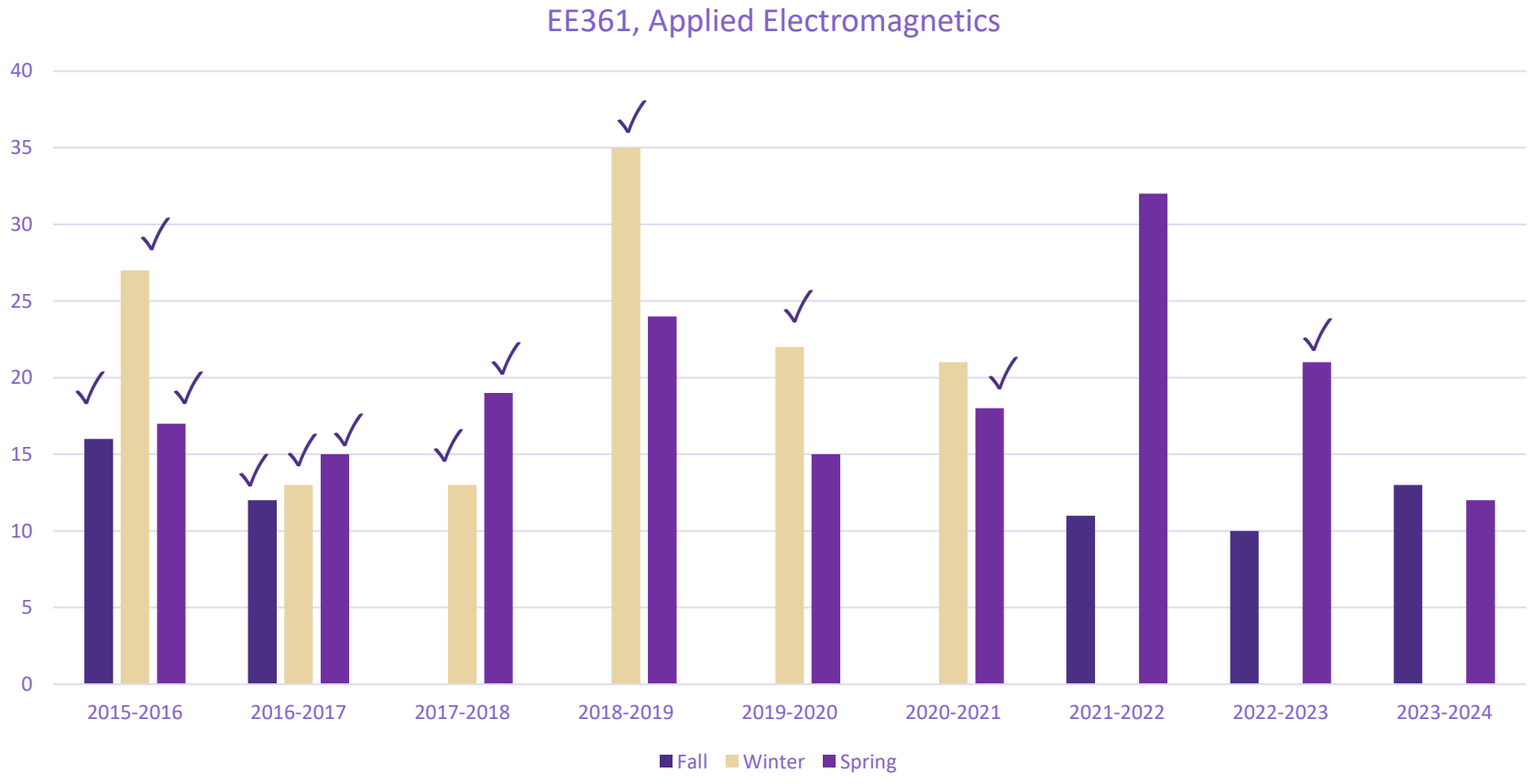
✓ Indicates that end of course report has been completed

EE421: Quantum Mechanics for Engineers (undergraduate)
EE521: Quantum Mechanics for Engineers (graduate)

ELECTRICAL & COMPUTER ENGINEERING

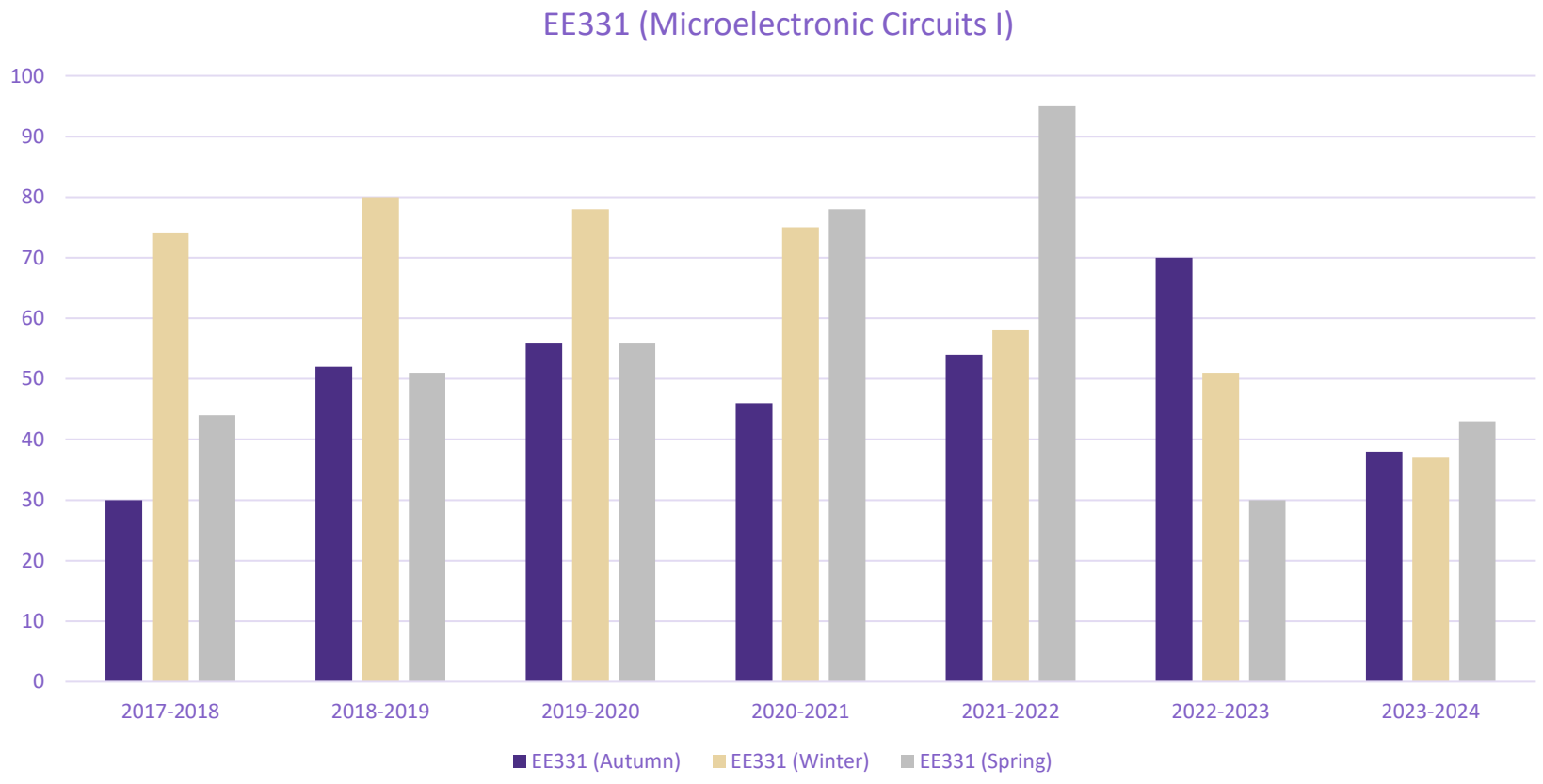
EE3XX Prerequisite Enrollments for Advanced Electronic and Photonic Devices

✓
Indicates that end of course report has been completed



ELECTRICAL & COMPUTER ENGINEERING

EE3XX Prerequisite Enrollments for Advanced Electronic and Photonic Devices



ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices End of Course Outcomes

EE482: Semiconductor Devices

	2020-2021	2021-2022	2022-2023	2023-2024
Outcome #1 (Solve Engineering Problems))				
Total Students Evaluated	3	10	10	9
Novice/Developing/Competent/Exemplary	0/0/1/2	4/4/2/0	2/3/3/2	2/3/2/2
Percentage Competent or Exemplary	100%	20%	50%	44%

There appears to be a significant problem with overcoming “formula sheet” mentality and is perhaps something we should address in earlier courses (the core) to enable students to go beyond formulas and interpret problems accurately and efficiently.

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices End of Course Outcomes

In follow up with Prof. Lin, she stated that this was a function of problem selection, not overall performance of the students.

EE485: Introduction to Photonics	2020-2021	2021-2022	2022-2023	2023-2024
Outcome #1 (Solve Engineering Problems))				
Total Students Evaluated	3	6	3	3
Novice/Developing/Competent/Exemplary	0/1/1/1	0/1/1/4	0/0/2/1	0/0/1/2
Percentage Competent or Exemplary	67%	83%	100%	100%
Outcome #6 (Experimentation)				
Total Students Evaluated				
Novice/Developing/Competent/Exemplary				
Percentage Competent or Exemplary				
Outcome #7 (Acquire New Knowledge)				
Total Students Evaluated	3	6	3	3
Novice/Developing/Competent/Exemplary	1/1/1/0	0/1/0/5	0/0/1/2	0/0/1/2
Percentage Competent or Exemplary	33%	83%	100%	100%

Advanced Electronic and Photonic Devices End of Course Outcomes

EE484: Sensors and Sensor Systems

	2020-2021	2021-2022	2022-2023	2023-2024
Outcome #2 (Engineering Design)				
Total Students Evaluated	6	6		Spring offering
Novice/Developing/Competent/Exemplary	0/1/5/0	1/2/2/1		
Percentage Competent or Exemplary	83%	50%		
Outcome #3 (Communication)				
Total Students Evaluated	6	6	6	Spring offering
Novice/Developing/Competent/Exemplary	0/1/3/2	0/2/2/2	0/0/2/4	
Percentage Competent or Exemplary	83%	67%	100%	
Outcome #5 (Teamwork)				
Total Students Evaluated	6	6	6	Spring offering
Novice/Developing/Competent/Exemplary	1/0/3/2	0/0/2/4	0/0/2/4	
Percentage Competent or Exemplary	83%	100%	100%	

Advanced Electronic and Photonic Devices Changes and Continuing Challenges

Course	Notes
EE331	Semiconductor Physics coverage must be removed (now covered in EE280), as it is leading to confusion among students who are taking the two courses concurrently. EE280 must be listed as a pre-requisite to EE331 (and likely EE332)
EE361	Student inexperience with vector calculus slows the class down
EE421/EE521	Students would benefit from previous exposure to scientific computing
EE482/EE539A	Course content was revised in Autumn 2020 to provide more time spent on relevant devices. However, formula sheet mentality is now limiting student success; this is likely an issue in other 4XX courses as well.
EE421/EE521	Students would benefit from previous exposure to scientific computing
EE484	Taught as non-capstone offering since and including Spring 2019. Concurrent project course offering in Spring 2023 worked extremely well but was not offered in Spring 2024 due to teaching resource limitations.
EE485	Too much content coverage was addressed by introducing Advanced Photonics Course. Splitting the course has corrected this issue.
EE486	Over half of students are MSE (MSE486) but MSE never teaches the course.

Advanced Electronic and Photonic Devices Student Evaluations of Teaching

In general, course evaluations for EE280, EE331, EE421/EE521, EE482/EE539, EE484/EE584, EE486, EE487/EE587, and EE488/EE588 have all received teaching evaluation scores (adjusted/combined) with some exceptions:

- EE280 (3.9 in Autumn 2023)
- EE361 (3.8 in Spring 2023)
- EE484/EE584 (3.9 in Spring 2023)
- EE486 (2.9 in Spring 2023)

ELECTRICAL & COMPUTER ENGINEERING

Advanced Electronic and Photonic Devices

AEPD has morphed into three pathways for the new BSECE degree: Microelectrons and Nanotechnology; Quantum, and Photonics. The courses in the BSEE AEPD concentration and in the three new pathways tend to attract a smaller group of students than other pathways like embedded systems, but these students tend to be highly invested in learning fundamentals and top performing students (many of which head to graduate school).

Larger issues to be addressed include:

- Formula Sheet Mentality
- EE280/EE331/EE332 Coverage and Overlap
- EE280 Coverage and Laboratories

ELECTRICAL & COMPUTER ENGINEERING